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REPORT

ON

THE GAUGE

FOR THE

ST. LAWRENCE AND ATLANTIC RAIL-ROAD,

By A. C. MORTON, Esquire,
CHIEF ENGINEER.

MONTREAL:
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REPORT.

ENGINEER DEPARTMENT,
Montreal, Sept. 20, 1847.

HON. A. N. MORIN,

President St. Lawrence and Atlantic Rail-Road Company.

SIR,—The Act to amend the Act incorporating the St. Lawrence and Atlantic Rail-road Company, passed at the late Session of the Provincial Parliament, 10th and 11th Victoria, Cap. 65, provides,

"That the Gauge upon which the said rail shall "be constructed, and which shall be used in the said "railway, shall be four feet eight and one half inches, "unless, within six calendar months, the Governor "of this Province in Council, shall, by Order in "Council, determine upon any different Gauge, and "that, upon communication to the said company of "any Order in Council, establishing any different "Gauge, the Gauge so established shall be the one "used in the said road as if the same had been "established in and by this Act."

The Charter of your road contemplates a connection at the boundary line with another road belonging to an American Corporation, the two forming a perfect line to the Atlantic coast.

It therefore became necessary in the early stage of these roads that the subject of the Gauge should be jointly considered by the two corporations.

After a careful consideration of the question by a convention of Directors from each corporation, Articles of Agreement were entered into relative to the general plan of construction, &c. dated April 17th, 1846, in which among other things it is provided (Article 5th) " that the Gauge shall be that " of five feet six inches in the clear between the " rails."

As this Gauge differs from that embraced in the recent Act of Parliament, it is proper that I should state the reasons which influenced me in recommending its adoption for your road.

The question of the best Gauge for Railways has, within a few years, been much discussed, and it is a subject upon which much difference prevails. The agitation of this question did not, however, take place until railway improvements were far advanced, involving a vast expenditure of money ; and it is not surprising that, under these circumstances, there should be a difference of opinion as to the propriety and expediency of a change.

In an abstract view of the subject, I believe Engineers generally consider that a wider Gauge than the prevailing one is desirable, to meet the requirements of the present advanced state of railway improvement.

With our present knowledge of Railways, were a new system to be commenced free from interest and

the prejudices of Engineers, committed to a particular width, there can be little doubt but that a different Gauge from that of four feet eight and a half inches would be adopted.

This Gauge had its origin from no scientific investigation of the subject, but from mere accident, it having been in use at a very early date on tramroads, upon which the ordinary wagons of the country ran.

From these it was copied for several Coal roads, and afterwards for the Stockton and Darlington, and Liverpool and Manchester Railways, which were the first constructed for passengers and general traffic.

This Gauge having been adopted for the first important road in England, was copied or extended by branches or other lines without any investigation of its merits till several hundred miles were built.

In the United States the same Gauge was usually adopted, and not without very good reason, for it was supposed that the experience already obtained in England, from having first introduced Railways generally on this Gauge, was sufficient evidence of its possessing all the requisite advantages.

As the first Locomotive Engines used in the United States were imported from England, it was doubtless considered advisable, both as regards economy and convenience, that they should conform to those already in use in that country, and this may have been a strong reason for adhering to the same Gauge.

The Great Western road in England was, I believe, the first constructed on what is now termed the

Broad Gauge, although an increased width of track had previously been proposed in the United States, and in a few instances adopted.

The South Carolina road, which is 136 miles in length, and was completed in 1833, has a Gauge of five feet.

The propriety of an increased width of track was laid before two or three Rail-road Companies, in the State of New York, in 1834 and 1836, one of which adopted a width of track of Six Feet for its road, which extends from New York to Lake Erie, a distance of 450 miles. *

There are 63 miles of this road in operation, and the construction of a large portion of the remaining distance is rapidly progressing.

Nearly all the remaining roads in New York have a Gauge of four feet nine inches.

Those of New Jersey, Ohio and Mississipi are four feet ten inches. The New Orleans and Nashville road, Louisiana, is five feet six inches, and all the roads of South Carolina, Georgia, and Florida, of which there are nearly 900 miles now in operation, have a width of track of five feet.

In nearly all the remaining States, the Gauge of four feet eight and a half inches has been adopted.

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*E. F. Johnson, Esq. Civil Engineer, as early as 1834, communicated his views to the Auburn and Syracuse Rail-road Company, as to the propriety of an increased width of track, and subsequently in able reports to the New York and Erie, and the New York and Albany Rail-road Companies, advocating the wide Gauge.

In considering the question of Gauge for your road, it is important not only to take into view the comparative merits of various widths of track, but the ultimate design of the road, the nature of the country through which it passes, and its connection with other lines; also, the state of railway improvements in the Provinces, the probable effect their construction will have on the business of the Canals, and finally, the position of Canada, commercially, and the benefits that will flow from the adoption of a judicious and well matured system of Railways.

The primary object of your road is to open the shortest and most direct communication between Montreal and the Seaboard, affording facilities at all seasons of the year for the transmission of merchandize, passengers, and the public mails, commensurate with the wants of a great commercial public.

A glance at a map showing the Atlantic coast, the St. Lawrence valley and the upper lakes, will impress the most casual observer with the important position of your road.

In connection with the Portland Road, it forms a continuous line from the St. Lawrence at Montreal to the Atlantic at Portland, which is from 70 to 100 miles shorter than any other line of improvement between these points, connecting on the one hand with a long line of inland navigation including a vast and fertile territory, and terminating on the other at one of the best harbours on the Atlantic coast.

These are features in your road which give it a commanding position, and indicate that, ultimately, it

must constitute the great thoroughfare and outlet for an immense trade. With a reasonable degree of assurance that these results will be realised, it appeared to me the part of wisdom that you should in determining on the plan of the road avail yourselves of all the improvements which long experience in this species of inter-communication may have suggested.

To keep pace with the increasing facilities of transportation, to meet the demands of a rapidly increasing trade, to compete successfully with rival lines, whose object is to divert trade from the St. Lawrence valley, and the public works of Canada, seemed sufficient reasons for giving to your road an enlarged capacity.

In northern climates it has been found extremely difficult to keep railways in a proper state of adjustment, and various expedients have been resorted to with a view more effectually to guard against the effects of frost.

Efforts to overcome this difficulty, have to a limited extent been successful, but it is only by constant attention and great cost that railways are retained in that state of repair required by a proper regard to safety and economy of transportation. Any inequalities in the surface of the rails from frost or other causes communicates to the cars an irregular rocking motion which adds to the resistance to be overcome and the inconvenience of passengers.

The increase of base afforded by a wider track with wheels of given size, lowers the centre of gra-

vity and allows greater ease and steadiness of motion in the cars, and consequently less wear and tear both to the machinery and the road and less danger of accidents.

With a view to the better accommodation of passengers, many railway companies in the United States have ordered cars of increased dimensions, some of which are 9½ feet wide, yet this increase is strongly opposed by car builders and is well known to operate unfavorably from the too great overhanging weight.

On long lines it is desirable to have large and well ventilated cars which will permit each passenger to have a separate seat with arms upon which he may lean, and room sufficent to change his position without incommoding or annoying the person in the adjoining seat; comfortable saloons should be provided for ladies and children, and the passage ways through the car should be sufficiently wide to permit passengers to walk about and pass each other conveniently. With the narrow Gauge these objects cannot be accomplished; but with the width of track adopted for your road, these improvements may be readily made, and still the motion of the cars with this increased width will be easier than that of smaller cars on narrow gauge roads.

Your road will furnish a cheap and expeditious conveyance for emigrants, by which they will be enabled to reach their place of destination at the most favorable period for securing a crop the first season of their arrival in the country.

The transportation of emigrants will undoubtedly

constitute an important branch of business, and for the second class cars the additional width allowed by a wider Gauge, will permit an increase in the number of seats, and the most advantageous arrangement for a larger number of passengers in a given number of cars. The weight of car per passenger carried would in this case be less than on narrow Gauge roads. For first class passenger cars it is preferable to give superior accommodations, which increases the number of passengers and the revenue of the road even though the weight of car per passenger should be slightly increased.

This however with your Gauge remains a matter of choice; for you may have the same weight of car with the inferior accommodations of the narrow Guage or by a very small increase of weight, furnish the most superior accommodation.

This is not a question whether the company shall construct narrow and inconvenient cars because they may cost or weigh less, but it is a question in which the public are interested and have a right to claim the best accommodations which the Gauge will permit. Besides it is well known that passengers are attracted in greater numbers to that road which gives the greatest accommodations; and therefore it becomes directly the interests of the company to offer every inducement which shall secure the patronage of the public.

On the Great Western Railway in England which has a Gauge of 7 feet, the weight of car per passenger carried, is no greater than the average of the London

and Birmingham, Grand Junction, Dover and Brighton, South Western and Midland Company, but affords far superior accommodation to passengers.

On the New-York and Erie Railway, in the state of New-York, which has a Gauge of 6 feet, the weight of car per passenger carried is 35 pounds less than on the narrow Gauge roads there, and affords equal room for each passenger.

The nature of the business to be done on your road, will undoubtedly nearly resemble that of roads in the northern part of the United States; and it is supposed that first class passenger and merchandize cars of a similar character to those in use there, will be found more appropriate for your road than cars of any other description. In reference to freight cars, it is believed that the wider Gauge of $5\frac{1}{2}$ feet will be found to afford superior advantage to those of the narrow track.

A greater width of car may be adopted which is better calculated for carrying all kinds of freight: much of which will be bulky.

The articles which would be transported to better advantage on large cars, are various kinds of light machinery, furniture, charcoal, hay, cattle, horses, calves, hogs, sheep, cotton, hops, wool, &c.

From the bulky character of such freight, it will doubtless often be necessary to limit the load below the tonnage which should be carried by each car, for want of space, and in such case a loss of power is sustained; for the number of cars in the train will be increased and their weight will compose a larger

part of the gross load. With larger cars a less length of train would be required for the same tonnage, thereby lessening the resistance to be overcome from side winds which increases with the length of the trains.

The resistance of a train in passing curved portions of a road, is also considerably lessened by diminishing its length.

Increased width of cars, gives greater advantage in hauling a given load under the same circumstances; for it is well known that the power is applied more advantageously to short trains than to long ones, and by diminishing the number of cars the weight of useful tonnage carried is greater in proportion to the gross load.

Freight cars need not necessarily be any heavier on your Gauge than they are now on most narrow Gauge roads; but if we avail ourselves of the greater capacity, which the $5\frac{1}{2}$ feet track allows, the weight of car per ton of freight which may be carried, will be less than on the narrow Gauge.

With a Gauge of 4 feet $8\frac{1}{2}$ inches, it is found difficult to arrange the working parts of an engine, and to give the requisite dimensions to the fire box and boiler, without raising too much the centre of gravity.

Nearly all the engine builders in the United States, with whom I have consulted, admit that they labor under great difficulty for the want of more room, and that a Gauge of 5 to $5\frac{1}{2}$ feet will allow them sufficient space to overcome all these difficulties.

It is owing to this inconvenience in arranging the parts and in making the repairs, that many builders have adopted outside cylinders for some of their engines.

These it is generally admitted are objectionable on many accounts and are likely soon to get out of use, particularly for engines designed for high speed.

They are more usually adopted for freight engines, on account of the less speed they are required to run, but for these they are nearly abandoned by the principal builders of the Eastern States.

It is however often the case that in order to make up for lost time, freight engines are necessarily run with great velocity, in which case all the objections to outside cylinders operate with full force. With this arrangement of the cylinders, the power is applied alternately to each side of the engine, which causes it to sway from side to side, and produces that galloping and oscillatory motion, so injurious to the machine and the road, and so productive of accidents. It is well known that by the application of the power nearer the centre of the machine, and the more fovorable position of the working parts with inside cylinders, the above difficulties are avoided.

The greater space afforded by a 5½ feet Gauge permits the most favorable disposition of these parts, and all the benefits resulting from their central position are fully realized.

Another reason assigned for the adoption of outside cylinders, was the frequent breaking of crank

axles ; but it is only necessary to manufacture these with proper care and proportion, to insure exemption from the difficuly. This has already been done and they are now deemed by many builders, as safe as the straight axle.

As before remarked it will be found, that inequalities and irregularities in the track are unavoidable, where frost operates with the force that it does here, and therefore it becomes important to lessen if practicable their evil effects upon the machinery and the road.

By increasing the width of track, the motion of the engine is easier and more steady, its various parts working more freely and with less danger of injury from sudden changes. It is desirable to have as large driving wheels as practicable without raising too much the centre of gravity of the engine. By enlarging the driving wheels, the same speed may be maintained with less velocity of the piston and less friction; and as most of the weight is on these wheels, their increased size lessens the shock which the engine receives.

Large wheels permit a more efficient and economical application of the steam, lessen the wear and tear of the working parts, and with an increased base give greater steadiness and security.

Both the lateral and vertical movements of the engine being easier, its action on the road will be less injurious, and there will be less danger of its leaving the track.

The more important advantages however resulting

to the engine from a wider track is the enlarged size of the boiler and fire box which this increased space allows.

As the power of the engine depends upon the extent of evaporating surface, all improvements which have reference to an increase of power have been directed to the enlargement of these parts.

The space however on the narrow Gauge being limited, the only means left to increase the heating surface is to lengthen the boiler and fire box. But there is a strong objection to the increased length of boiler on account of the loss of power required in creating sufficient draft through their long tubes.

In some cases they have been so much extended, and the additional length so far removed from the fire box, that it has proved a positive disadvantage: Much of this increased length of tube is inefficient; and from their remote position from the fire add only in a small degree to the evaporating power of the boiler, for the air must be drawn through this additional length of tube, giving increased friction and requiring a stronger blast and a serious loss of power. It has been observed on an examination of tubes long in use, that the effect of the heat is visible only on the portion nearest the fire box.

Long tubes are more liable to get out of order or leak, than short ones, on account of their flexibility and the distance between points of support.

This has proved to be the case even with new engines which had been in use but a short time. To remedy this defect, supports have been placed mid-

way of their length; but these have given rise to other evils which are equally objectionable.

There can be no doubt that with equal superficial area, short tubes are the best, as they present a larger surface near the fire, are less liable to get choked, or out of order, and require less blast to produce the proper draft through them.

Mr. Stephenson, the great advocate of the narrow Gauge, in his testimony before the Gauge Commissioners, states that they have made the boiler as wide as the narrow Gauge will allow ; and this is evident from the various expedients resorted to for the purpose of gaining an inch or two in width of fire box. He also states that he has increased the power by lengthening the boiler and fire box ; and that the engines are as large as ought to be put on the present roads.

It should be remembered that the weight and power of engines had been from time to time increased ; that roads had been rebuilt, and their parts made stronger, in order to sustain these heavier engines up to the time when it was ascertained that the narrow Gauge did not admit of a more powerful engine. Then, and not till then, was it stated that the engines were as powerful and as heavy as ought to be placed on any road.

There is no doubt that if more powerful engines could be built on that Gauge, there would be no difficulty or hesitation in providing sufficiently strong roads to sustain them. The Commissioners in their report to Government, remark in reference to the

narrow Gauge engines, that they "are as powerful as they can well be made within the limits of this Gauge."

Major General C. W. Paisley, Inspector General of Railways, whose opinions from his position and from his not being an advocate of either the narrow or broad Gauge, are entitled to great respect, states in his testimony before the Commissioners, that "he "does not think the Messrs. Stephensons' opinions of "the sufficiency of the narrow Gauge of 4 feet 8½ "inches for all purposes has been born out by the "subsequent experience of more than two years. The "Gauge of 4 feet 8½ inches does not admit of a boiler "of sufficient diameter or of a fire box of sufficient "width to give such power to the Locomotive engine "as is required by the present state of railway travel- "ling. Mr. Robert Stephenson has attempted to get "rid of this disadvantage by lengthening his boiler in "the best engines constructed by him, which are also "made with outside cylinders. The lengthening "of the boilers appears to me to be a failure, "since it has not produced engines equal in power "to those of the Great Western Railway; and "some of the engines with long boilers which I "have observed by travelling upon them, especially "the one called the White Horse, of Kent, used on "the South Eastern Railway go very unsteadily, "oscillating or rolling very much, which, if the "speed were materially increased I think might, "prove dangerous, and which must have a tendency "to injure the permanent railway." "As a further "proof of the inefficiency of long boilers to obtain

"the object in view, I may remark that the engines "made by the Messrs. Sharp (brothers,) formerly "Sharp and Roberts of Manchester, as well as Mr. "Trevethick, of the Grand Junction Railway, at "Creeve, and by Mr. John Gooch, of the South "Western Railway, travel as quick as those long "boiler engines of Mr. Stephenson's, and much "steadier."

From the above testimony, it appears that engines with boilers of ordinary length in use on several roads, had produced as great results and attained as high speed, with less oscillatory motion, than the engines with long boilers. It appears further, although the advocates of the narrow Gauge had asserted that it affords all the room necessary for sufficiently powerful engines, yet, a great effort had notwithstanding been made to add still further to that power, but with, to say the least of it, doubtful success.

The attempt to give engines on the narrow Gauge increased power by lengthening the boiler may be regarded as a failure; and no means have been suggested whereby it is likely to be accomplished, except that of increasing the diameter of the boiler, and the width of the fire box. A wider Gauge will undoubtedly afford space for these changes, and lessen the irregular motion of the engine and its liability to run off the track.

The power of an engine is in proportion to the extent of its evaporating surface, or perhaps more correctly in the language of Mr. Stephenson; "The

"power of the engine, supposing the power to be "absorbed, may be taken to be directly as the area "of the fire grate or the quantity of fuel contained "in the fire box."

Increasing the size of the boiler and fire box so as to bear the same proportion to a 5½ feet track that those of a narrow Gauge engine now do to 4 feet 8½ inches, would add to the extent of heating surface nearly 25 per cent.

This allows an important increase of power which will lessen the cost of transportation, and will prove highly beneficial in other respects.

There is always an advantage in having a large boiler and fire box; and although it may not be necessary at all times to use the power to the full extent, yet the same result may be obtained with greater economy, and less intense heat, consequently less injury to those parts of the engine, which are so soon destroyed by fire.

The repairs of Locomotive Engines constitute a large part of the expenditure for power; and these repairs are required mainly on those parts exposed to the injurious effects of great heat. To work an engine economically, the boiler should never be forced by a strong blast, but the draught should be such as to produce only the amount of steam that may be applied usefully.

There is an advantage in being able to call into action the increased power, which is at command with a greater extent of heating surface and equally intense heat, for the purpose of more readily over-

coming the greater resistance on portions of the road where steeper gradients prevail, or where storms of sleet and snow may have been unexpectedly encountered.

The latter difficulty is often experienced on Northern roads, and more powerful engines will be found of the greatest importance as regards economy and punctuality.

The utmost punctuality is required in the running time of trains, more particularly so on roads having but a single track where trains must pass each other at given points. A large number of the roads in the United States have but one track, and very many of the accidents on these roads result from not running to time. Delays are occasionally unavoidable, particularly with freight trains, and more powerful engines will often be capable of making up lost time, and at all times to run with greater regularity and punctuality.

But there are other and more important reasons in favor of more powerful engines. The revenue of the road is in direct proportion to the freight and passengers carried.

The effect of engines of great power is to increase the tonnage of each train, thereby with a given amount of traffic to reduce the number of trains and the number of engines required to do the business of the road.

The expenses of a road are, nearly as the miles run; therefore the effect of transporting an equal

amount of tonnage with a less number of trains is an increase of net revenue.

An engine capable of drawing 20 tons of net load more than another, will, applying an average charge of $1\frac{1}{4}$ pence per ton per mile, increase the earnings 25 pence for each mile run; and, allowing that your freight engines will run 300,000 miles per annum, the increased earnings by adding this amount to the average loads will be £31,250 per annum:—that is nearly 50 per cent. of the whole cost of running freight trains this distance.

By adding to the power of the engine, a much larger business may be done with but a small increase of cost. Many of the expenses of Locomotive power are the same whatever the power of the engine. The cost of Engine-men and Fire-men, the proportionate expense of superintendence and management, the cost of oil, &c., are the same. The cost of repairs of engines do not increase in proportion to the power or the loads drawn, but, nearly, as the miles run.

As it regards fuel, it may be observed that it varies with the load, but the ratio is modified somewhat by the amount consumed in getting up steam and in standing at the station. A large engine working to the *full extent of its power*, as a matter of course, consumes more fuel than a small one under the same circumstances. This is the only item of increased expense, and this is fully reimbursed by diminishing the delays, accidents and extra labor attending the use of a greater number of Engines. The Gauge Commis-

sioners admit this, and state decidedly that economy is in favor of large engines when working at their full power.

On many narrow Gauge roads it is customary to use assistant engines to a great extent, and on the London and Birmingham road, nearly 29 per cent. of the whole number of miles run by passenger trains during the half year ending June, 1845, were with two engines to each train.

This would not be the result were the engines on that road more powerful. Trains propelled by two or more engines are of necessity delayed at all the wood and water stations, or where cars are to be taken and left on side tracks.

Attaching a number of engines to one train operates most unfavorably, from the unequal manner in which the separate engines act, and the increased liability to accident. It also adds very materially to the cost of transportation.

Mr. J. M'Connell, Superintendent of the Locomotive Department of the Birmingham and Gloucester Railway, a narrow Gauge advocate, states in his testimony before the Gauge Commissioners that, "We "find from experience that economy of working is "very much assisted by taking the trains by one "heavy engine instead of two light ones, that is to "say, you save the wages of two men, and I think "the expense of repairs is very much reduced, and "materials, for instance, oil, tallow, &c., and the "consumption of coke in the one engine is not at all "equal to the consumption of the two, which only "do the same amount of work."

Mr. William Cubitt, a distinguished Civil Engineer, states in his testimony before the same Commissioners, that, "Large and powerful engines are "more cheaply worked in proportion than smaller "ones, for the work they do," and adds, in relation to the consumption of coke, &c., "that they are "cheaper altogether. With regard to manual attention, and all that, it takes the same expense to work "a small engine as it does a large one, and they can "be more economical in coke, with reference to the "work they can do. The same quantity of repairs "will cover more work."

The first cost of large engines is cheaper in proportion to their power than small ones.

The history of every species of transportation affords evidence of the advantage and economy of carrying large loads. Canals and railways were introduced on account of the facilities they afforded for moving large loads, thereby lessening the cost of transportation.

The enlargement of the canals of New York, Pennsylvania and Canada, was made for the purpose of increasing the tonnage of vessels, as a means of lessening the cost of transportation.

By enlarging the Erie Canal from its original dimensions to 7 feet deep and 70 feet wide, it was estimated that the cost of transportation would be reduced 50 per cent.

It is ascertained from experience that increasing the tonnage of boats on the Delaware and Hudson Canal from 31 to 45 tons, reduced the cost of trans-

portation 33 per cent., and the saving this made on the business of the canal for two years reimbursed the cost of its enlargement. By the application of steam to vessels for navigating lakes and rivers and also large canals, a larger class of vessels have been introduced, carrying greatly increased loads, and the effect has been a great reduction in the cost of transportation.

These various modes of transportation alluded to, show the efforts that are making to provide more efficient means for the vastly increasing business of the country and the advantages which will accrue from increased facilities and ability to move larger loads. If we refer to the history of Rail-roads, it will be observed that from the time at which they were in the most rude state up to the present day, there has been a constant effort to gain an increase of power.

It was not till 1829 that any very great improvement of the Locomotive engine was accomplished; and from the opening of the Liverpool and Manchester Rail-road in 1830, we may date the introduction of Locomotive engines generally on railways in preference to any other power. From that day to the present there have been constant changes and improvements going on in the character of engines and the railways upon which they were to operate.

I need scarcely allude to the vast improvements which have been made within a comparatively short space of time, for every person is familiar with the subject.

When it is recollected however that in 1829 it was considered a great feat for a Locomotive to draw 12½ *tons* 70 miles at the rate of 14 *miles per hour*, it certainly must excite feelings of the utmost admiration that in 1846 a locomotive engine on *the broad gauge* was able to draw over 100 *tons*, a distance of 116 miles at an average velocity of 49 *miles* per hour, running 10 miles of this distance at the rate of 66 *miles* per hour, and two miles at a speed of over 69 miles per hour.

These are results that have been obtained in England by the adoption of the broad Gauge, which has been in use comparatively but a short time. The narrow Gauge having been adopted on the first introduction of railways, improvements have from time to time been made in the engines of this width till finally, as the Commissioners state, no further addition to their power can well be made, yet their best performances fall far short of the results above stated. What results may we not expect when the same efforts shall have been made to develope the power of the broad Gauge engines?

Large and powerful engines have been objected to on account of the injury which they cause to the road. With heavy engines it is of course necessary to construct a more perfect road and to either increase the weight of the rail or the number of bearing points of the engine. The plan of track adopted for your road contemplates the use of the heaviest class of engines. The rail is of an approved pattern both for strength and durability and with the continuous

support given by the sills it is equal to a rail of 80 or 90 pounds per yard on cross sleepers as they are usually laid.

It is urged as an objection to the broad Gauge that the resistance is greatly increased in passing around curves in consequence of the greater length of the outer rail and the slipping of the wheels in passing over this increased distance.

No difficulty has been experienced in passing around curves of small radius at great velocity even with a Gauge of 7 feet, and with a Gauge of $5\frac{1}{2}$ feet the width bears so small a proportion to the radius of the curve that there would be no difficulty in this respect and but a small increase of slipping would result from the excess of width over the narrow Gauge were there no provisions to lessen its effects.

Improvements have been made both on Locomotive Engines and Cars which lessen the resistance on curves, and this undoubtedly will be still further reduced by improvements which are constantly making in Rail-road machinery.

As Cars were formerly constructed, the axles being placed at a geater distance from each other, the friction was greater. In the United States, four wheeled Cars have mostly gone out of use, and those having two pairs of wheels at each end of the Car have been adopted, the axles of which are placed nearer together, which obviates in a great degree this difficulty.

On your road, as well as other great lines in Canada, the character of the country is such as to

require comparatively but a small amount of curvature, and this increased width of track will not be attended by any material loss of power or inconvenience in this respect.

The increased cost of construction is another objection urged against a wider Gauge to which much importance has been attached.

But on examination, this will be found comparatively of little importance, particularly with the Gauge adopted for your road. The width of road bed is not necessarily increased, although in the consideration of this subject it would be well to provide as much additional width as is given to the tracks.

Most of the narrow Gauge roads in the United States are graded in the first instance for a single track, and the width of road bed on embankments varies, being on different roads from 12 to 15 feet. For double tracks it is generally from 24 to 26 feet.

Your road is being graded for a single track having a surface width of 15 feet with provision for a double track which is 26 feet.

The New York and Erie Rail-road which has a Gauge of 6 feet is graded for a single track with a width of road bed on embankments of 15 feet, while many of the narrow Gauge roads have the same width, and no inconvenience is experinced for want of more space in either case.

The London and Birmingham road in England and several narrow Gauge roads in the United States have a width on embankments of 26 feet, and this is the width proposed for your road. It therefore appears

that on many important roads of that Gauge as great a difference exists in the width of road bed as would be the increase necessary for a Gauge of 5½ feet.

The width from centre to centre of tracks will be determined by the width of Cars from out to out, and the space between Cars when passing each other.

On most roads the space between tracks is 6 feet and the width of Cars has been increased to 9 feet 6 inches, and in some instances to 9 feet 8 inches.

The clear space between Cars should not be less than 18 inches and assuming the width of Cars to be 9 feet 6 inches, the distance from centre to centre of tracks will be 11 feet.

Now, if we allow the space for both Gauges to be 11 feet, add the width of track, and it gives for the narrow Gauge 15 feet 8½ inches, and for the 5½ feet track 16 feet 6 inches between outside rails, making a difference due to the latter Gauge of 9½ inches.

But allowing 18 inches between Cars, with the widest Car that would ever be likely to be adopted on 5½ feet Gauge, the increase width of road bed would be only 2 feet. This extra width if strictly applied to all parts of the road would require an increase of 2 feet in the length of culverts, bridge abutments, &c. This addition is of course to the body of those structures only, the wings, parapet walls, &c., remaining the same in either case.

These additions were they really made would on your road amount to but a trifling sum, as there are scarcely any deep rock cuttings, heavy excavations or

embankments, and no tunnels. The mechanical structures are generally of a cheap character.

But it is not proposed to add to the dimensions; for the width which is adopted on narrow Gauge roads has been found to answer every purpose for an increased width of track. The space left outside of the rails for your road, as now graded, will be nearly 5 feet; and this is deemed sufficient.

The bridges have, when the road-way is on the lower chords a clear space between the trusses of 15 feet, yet on several narrow Gauge roads the space is no less, while some have more than this.

Bridges designed for the road-way on the top chords, (of which character are nearly all your more important structures) are not necessarily enlarged, for the trusses may be placed in such a position as will conduce both to economy and strength.

The trusses of this description of bridge in course of construction for your road are placed 12 feet apart for a single track which with the thickness of the trusses, gives a top width of from 16 to 18 feet, and when the third truss is added for a double track, it is placed at a distance of 9 feet, the masonry being designed for this in the first instance.

This effects a great saving, and the dimensions need not differ from the same kind of bridge designed for a narrow Gauge road. Adopting the same kind of track which is proposed for your road, the difference in cost would be a mere trifle or with a cross sleeper road, the increased cost would not exceed (£8) eight pounds per mile.

As it regards the cost of Cars, I am able to state from communications of builders on the subject, that the increased cost will be comparatively small, and will consist mainly in the extra weight of the axles due to a greater width of track.

It is probable that with a 5½ feet track, inside bearings for Cars will be considered preferable, in which case the axles will be about 3 inches shorter than those at present in general use on the narrow Guage. Car builders state that the cost of Cars of this description will be no more for the wide track than for the narrow. It is stated on roads where both inside and outside bearings have been extensively used, that the former are preferred, and that for Cars to be constructed hereafter no other will be used,—that, with inside bearings, the Cars are easier on the journals and the road, and are in every respect safer, that the journals are less liable to break, the Cars move easier around curves, and in case of breaking a wheel or axle, the effect is less disastrous to the train and the road. They are objected to on account of the greater trouble of oiling, and liability to get more dirt in them. The former is a comparatively small objection, and the latter, if it exists at all, may doubtlessly be removed.

The amount paid for the last Passenger Cars ordered for the Erie Road, (having a Gauge of 6 feet) which seat 69 Passengers independent of the saloon, was no greater than is charged for Cars of the same finish, seating the same number of Passengers for the narrow Guage roads of the Eastern States.

The cost of Engines will be no more in proportion to their effective Power for a wide Gauge than for a narrow; and I was informed a short time since by a large manufacturer, that he would make no difference in the cost between Engines on the ordinary Gauge, and those of $5\frac{1}{2}$ feet track.

The reasons assigned, are the greater conveniences and facilities for arranging economicaly the working parts for inside connections.

Allowing that the items of increased expense above referred to are incurred on your road, (which as before remarked will not be the case), the aggregate will not amount to $1\frac{1}{4}$ per cent. on the total cost of the road.

It has been suggested that greater difficulties would be encountered in removing the snow on a wide track than on a narrow. The increased resistance from this cause, resulting from the difference between the narrow track and the Gauge adopted for your road, will, I believe, be found very small and hardly worthy of notice.

It certainly will prove of little consequence compared with the increased power which this greater width gives to the engine. It is a strong argument in favour of a wide Gauge that the engines may be constructed of greatly increased power, with a view to overcome more readily this difficulty.

As an evidence that the effeet of widening the Gauge, and increasing the power of the engine, is to lessen the difficulties of removing the snow, I would refer to the great snow storm of 1845, which ob-

structed nearly all the roads in the northern part of the United States.

The Erie road, with a Gauge of 6 feet, lost but one trip, while the main lines (narrow Gauge) south of New York, were impassable for a number of days.

You are aware, however, that from the favorable character of the country a very large portion of your road will be on embankments elevated five or six feet above the general surface of the ground, which will much facilitate the removal of snow, allowing the winds to sweep more freely over its surface, and thus prevent any great accumulation on the track.

The most prominent objection which can be made to a wide track is, the connection with other roads of a different Gauge, and the necessity of transferring freight and passengers from one line to another.

This, under certain circumstances, would evidently be so serious an objection as to overcome all considerations in its favor, and again, under other circumstances, it may be less objectionable than other difficulties.

As it regards the connection of your road with other lines, I know of only one which is now contemplated that would have any bearing on the subject of Gauge.

As there are but 15 miles of road in operation in Canada, and only 8 more for which definite arrangements are made for the narrow Gauge, the question of connection is not therefore necessarily involved in any difficulty here. From the position of Mont-

real, the great mass of freight would necessarily be transhipped here.

This at present is unavoidable. In the event of the construction of a bridge across the St. Lawrence, which is a work entirely practicable, and of great merit; and also, the construction of a line of roads extending to the Upper Province, there would still be a transfer of a very large quantity of freight at Montreal, particularly during the season of navigation.

Should a bridge be constructed across the St. Lawrence River, there is no practical difficulty in carrying your road and the St. John's road over on the same bridge on account of a difference of Gauge, and further than this there is no necessity for a connection.

And until other roads shall have been constructed above the Lachine road, there will be no reason for a connection with this Line. The question of Gauge, therefore, so far as concerns a connection with any other road in Canada yet constructed, is an open one, and is not embarrassed by existing lines.

There is a branch, however, contemplated, by which it is proposed to connect your road with the Passumpsic and Connecticut River Rail-road, in the State of Vermont, which is intended to form part of a line to Boston.

This may be considered an important branch to your road—the peculiar features of which, and the nature of the business to be expected from it, we will proceed to consider.

The distance from Montreal to Boston, via the most direct lines now in connection with the Passumpsic road, is about 387 miles, and in this distance there are six different Corporations. These roads will differ in length from 14 to 128 miles, and each of these, so far as completed, is operated by the Company to whom it belongs.

The chief objection to this route for through traffic, as compared with the Portland line, consists in its greater distance to the Seaboard, and the greater number of separate roads of which the line is composed.

When several roads are operated in connection, forming in the aggregate a line of several hundred miles in length, with lateral lines extending in various directions, it is found extremely difficult so to regulate the distribution of Cars as to meet the demands of trade.

Serious difficulties have been encountered in the United States, where many long lines are composed of distinct roads of various lengths, operated by separate Corporations.

Each Corporation has its local trade which it is highly important should be accommodated; to do this, cars must be provided for each station on the main line and its branches; and at the same time others returned to the several branches of other roads, composing the line, and to latteral roads, which constitute parts of other main lines.

It will be readily perceived that without the most perfect arrangement there will be difficulties in

returning the required number of cars to all the stations at the time they may be wanted.

Cars often find their way on to other lines which have no arrangement for an interchange and are missing for months.

There are periods of the year when there is a vastly increased amount of business to be done not only of local but of through traffic, and in many instances the trade preponderating greatly in one direction, the cars are many of them to be returned empty.

Trade varies on different roads, and is subject to changes more or less at various stations on the same line, and it often becomes difficult even for one corporation to systematize its business so as to return cars to the proper stations to meet the immediate demands of its own trade.

But when we combine a large number of corporations having an aggregate length of road of three or four hundred miles, each corporation operating its own road and each striving to accommodate its own local business, there will unavoidably be much confusion and irregularity.

The agents at the various stations are always desirous of securing the requisite number of cars to dispose of freight that may have been left in their charge, with the urgent solicitation of the owners that it should be forwarded immediately.

And often various descriptions of freight must reach market within a limited time, or the owner and the company with whom it is deposited suffer serious loss.

Under these circumstances, it is not surprising that every station agent should use every effort to secure a sufficient number of return cars in which to forward the freight left in his charge.

Commencing at the end of the line towards which is the greatest tonnage, the cars on their return are many of them empty or lightly loaded, and these are to be left at various stations, the number to be regulated by the amount and the pressing nature of the business to be done.

The consequence is that in the anxiety to accommodate all the business, the greater number of cars are left at way stations and branches nearest the terminus or market, while the more remote stations in the interior and the other extremity of the line are unsupplied.

These difficulties are much enhanced by an increased number of roads forming the line, particularly when each road is under distinct management.

There is now in operation an uninterrupted line of railway between Boston and Buffalo. The distance is 535 miles and there are ten distinct corporations each of which operates its own road.

The difficulty of effecting satisfactory arrangements with the several corporations, and the impossibility of controlling the return and proper distribution of cars to the several roads, render necessary a transhipment of freight at Troy.

But even with this division of the line it is found extremely difficult to return the cars westward so as to meet the demands of trade.

A portion of the time during the great press of business last winter, it often occurred that there were no freight cars, or a very limited number, west of Syracuse, about mid-way of the line between Troy and Buffalo, nearly the whole being detained on the eastern portion of the line.

This result arose in a great degree probably from imperfect arrangements and the want of a full supply of cars; but it shows conclusively that on a long line of roads operated by separate companies, much difficulty will be experienced in the return of cars.

There is a strong objection on the part of most Companies to their cars going a great distance off their road and beyond their immediate control, particularly when their own line is of much extent having branches and a large local trade.

It is stated that the Boston and Worcester and Western Rail-road Companies, whose roads form part of the line between Boston and Buffalo, will not allow their cars to go west of the Hudson river or to leave their own roads except to pass over the Greenbush and Troy road of 6 miles length, for the purpose of receiving the freight transferred to them from the Cars of other Companies west of Troy.

The inconvenience of exchanging cars are represented, by persons who have had much experience on roads where it takes place, to be very great and the cost of repairs very considerably increased. Cars furnished by so many different Corporations often differ materially in their construction, their strength, the ease with which they run, and the amount of service they will perform without extensive repairs.

They are not subject to that constant and careful inspection, in passing over so many roads and such long continuous journeys.

Small repairs are more apt to be delayed till the defect becomes serious, and consequently the cost of making it good much increased.

Defective cars are often neglected from a desire that they may be returned to the Company to whom they belong, for the necessary repairs, and this will often be the cause of serious accidents and at all times of increased expense.

The regulations in regard to the inspection and prompt repair of cars, cannot be too rigidly and strictly carried out, for a little remissnes is often the cause of serious results.

With reference to the transfer of freight, there are many strong objections and ordinarily, it should not be permitted, but even this will for very long lines under certain circumstance, I believe, be found preferable to an interchange of cars. There are many kinds of freight which may be transferred from one conveyance to another with great dispatch and economy.

The article of flour which will constitute a most important article of freight on your road, I am informed on good authority, is transhipped from cars to vessels at Détroit, at the rate of one shilling for 100 barrels. Freight is transhipped at Albany, from canal boats to barges, at the rate of two pence per ton.

At other points in the United States, where a large amount of merchandize is to be transhipped, it is done with great economy by machinery propelled by steam, and it is believed that improvements will be made for the transfer of freight on Rail-roads, that will materially reduce the cost, and render it on every account far less objectionable than at present.

It is simply a question of cost, and if facilities of transhipment are such as to make the cost and inconveniences no more than the difficulties and expense resulting from an extended interchange of cars, I believe it will be adopted in preference.

Much has been said about the difficulty of transferring cattle and other live stock from one car to another. But every one knows who has had any experience in the business, that with suitable arrangements there is no practical difficulty and necessarily but slight delay.

All that is required in loading cattle in the first instance into cars, is to have a yard parallel with the train of cars, with inclined passage ways leading to, and on a level with the floor of the several cars, through which cattle are readily driven on to the cars. So in transferring cattle from one train to another, it is only necessary that the trains should stand parallel, and opposite each other with an intervening platform, and passage ways provided, through which cattle are as readily driven as they would be through a lane or a narrow street.

The same operation would effect the transfer of all kinds of live stock with equal facility. Live stock is in fact the cheapest of all kinds of freight for transhipment.

The time occupied in doing this with such arrangements as should always be provided, would not be greater than is now often required at stations in loading or unloading freight where no change of cars takes place.

There would be little difficulty in transferring several kinds of freight without breaking bulk either by removing the car bodies or by the use of boxes, both being effected with steam cranes or other machinery.

In the evidence before the Gauge Commissioners it is stated by an Engineer (not connected with the broad Gauge interest) of great experience not only in the construction of railways but in the transfer of freight by both the above methods, that "there was no difficulty whatever in doing it." And he further states that, on a large scale "the cost would not exceed half a penny per ton."

On the main line of the Pennsylvania improvements, freight is transhipped in crossing the Alleghany Mountains from the Canal to Rail-road on one side, and from the Rail-road to the Canal on the other side of the Mountain, without breaking bulk. A transhipment takes place on the main line of the New York Canals at Albany, where over one million of tons arrive annually, and in fact transhipments occur on all the leading routes from the Seaboard west.

Wherever a transfer of merchandize is necessary or advisable which will often occur for various reasons in an extensive country, there will always be abundant means to effect it expeditiously and economically.

But in reference to the Passumplic branch of your road, it is not simply a question of the policy of transferring freight from one Gauge to another. There are other circumstances connected with this branch which have an important bearing. The amount of the freight that will be likely to pass this branch, and the nature of the business generally, enter into the consideration of the subject.

Your road, as stated in another part of this report, is designed to furnish the shortest and best communication with the Seaboard; and with a view to avail yourselves of all the natural advantages of your route, to furnish to the public the conveniences and facilities of transportation which the nature and extent of the business to be done require and to enable you to compete successfully with rival routes, you deemed it important to give to your road an enlarged capacity.

Now the question arises whether the connection with this branch, situated, as it is, holds out sufficient inducement in the amount of its business for the attainment of which it would be advisable for you to sacrifice the great and manifest advantages of your main line.

The distance as before stated from Montreal to the Seabord by this branch, and the roads to connect with it, will be about 107 miles longer than by the main line to Portland.

The great number of Corporations on this route, over whose roads the business must pass, and the difficulties attending it have also been alluded to, such as the separate management of each road, con-

sisting of the officers, agents, and clerks of each Company, each furnishing its own power with engine-men, firemen, conductors, &c., whether the road is 20 or 120 miles in length.

The terminus on the Seaboard is not at the open harbor of Boston, but in the rear of the City where freight destined for a foreign market must be subject to the delay and embarrassment of vessels approaching it through numerous draw-bridges and accumulation of ice in winter, or be carted across the City.

These are peculiarities which have a direct tendency to increase the cost of transportation, and should they be found so great as to increase it materially it is a question whether any very large amount of through freight will take this route.

With this great difference in distance and the other disadvantages above mentioned, there can be no doubt that the cost of transporting all descriptions of freight from Montreal to the Seaboard by the branch route will be very much greater than by your main line.

As it regards the curvatures and grades of the two routes, if any difference exists, it is but slight, both may be regarded as favorable.

You are aware, however, that on the Portland line a very large portion of the distance is nearly level or descending towards the Seaboard.

There are but two Corporations comprising this line, whose charters were granted by the respective Governments with a view to their being united as one road, and the sole object of these Corporations,

through all the incipient stages of the work, and up to the present time has been to consolidate the interests and render the roads indentical. The same system as it regards their location, the plan of construction, the width of track, and the general system of conducting the business of transportation, when these roads shall have been finished, has been mutually agreed upon by the two Companies.

The length of road to be built by the two Corporations is nearly the same, each being a favorable distance to operate economically, and uniting at the same time at the boundary line between the two countries.

The terminus at the seaboard is at one of the best harbours on the Atlantic coast; it is large and capacious, easy of access and is never closed with ice. The terminus is so located as to be parallel with the main harbour, presenting an uninterrupted wharf of half a mile in extent, along which every class of vessels may be safely moored to discharge their cargoes and to receive directly from the cars their return freight.

These are the leading features of your main line, and they are alluded to not with the view to draw an invidious comparison or a desire to detract in the least from the merits of the line which is proposed to form a connection with your branch, for I regard it as an important line and one which will add very considerably to the revenue of your road.

But it is with the view that the subject of transportation of through freight may be more fully under-

stood, that you may judge more accurately as to the probable route the mass of the business will take, and the bearing this may have on the Gauge of your road and your ability to compete with other lines, whose object is to turn the trade from the St. Lawrence before it reaches you.

The efforts that are now making to deprive you of the trade to which you are naturally entitled by your position, are such that it not only effects in the greatest degree the interests of the Stockholders in your road, but the whole business population of the lower province.

It is a subject of serious consideration with you whether it will be more for the interest of your Stockholders and the public at large to adopt a narrow Gauge for the sake of uniformity with foreign lines which cannot add to your ability to compete for this trade, or to adhere to one of the great advantages which will give your main line the superiority beyond a question.

Owing to the greatly increased distance and other disadvantages of this branch as contrasted with your main line to Portland, it does not appear likely that a large amount of merchandize forwarded for shipment to England or to a foreign market, will pass over this road.

To illustrate the subject we will suppose that the distance *via* this branch is only 370 miles.* The dis-

* The distance as given in the printed reports of the several companies, together with the distance from the Boundary to Montreal gives a total of 387 miles between the latter place and Boston by this route. This however, may be hereafter reduced by new lines, and I have assumed above that the distance will be only 370 miles.

tance to Portland as now surveyed by the longest route, is 280 miles, assuming that an average charge of $1\frac{1}{4}$ pence per ton per mile is made on freight, the cost of each ton carried to Boston over

this branch will be.....	£1	18	6
And each ton carried to Portland *via* the main line will be	1	9	2
Giving a difference in cost of.....	£0	9	4

per ton in favour of the main line, not including truckage or extra expense at Boston in reaching vessels.

The question of transhipment as it regards the mass of freight, has with this view of the subject, little bearing, for it is supposed that generally it would take the cheapest route, and should the advantages of a wider Gauge and a less number of corporations lessen the cost of transportation, the above difference in favor of the main line will be still further increased.

It may be thought, by some persons unacquainted with the circumstances, that as Boston exceeds Portland in population and in business, that the advantages of making shipments would be greater there than at the latter port.

When it is recollected, that the State of Maine exceeds any other State in the Union in the number and capacity of her harbors, and in the tons of shipping which she now annually puts afloat, there need be little apprehension about the facilities of making favorable shipments, when your road shall have been extended to that port. And, as before remarked, the

advantages of Portland Harbor, as it regards its capacity, safety, and freedom from ice in the winter, its position and accessibility, and the far greater economy with which it is reached from the interior, are such as to give it a decided superiority, as connected with your trade, over any other port of the Eastern States.

Adopting a wide track does not cut off your trade from the direction of this branch, for it is shown that there is a transhipment on the main line of roads passing through the State of Massachussetts, and New York, all having the same Gauge, and forming the most important line of railway communication in the United States.

The circumstances of these roads are similar to yours in connection with this branch, and the other lines forming its extension to the same point in the State of Massachussetts, and they are such as at present to render a transhipment necessary.

Notwithstanding this, a large business has been done; and why should not the business of the Passumpsic branch be done with equally favorable results.

It is alleged, that a large business would be done with Boston, and that the adoption of a wider Gauge cuts off the connection with the line leading to that city, and therefore does not allow a choice of markets.

On a full view of the subject, I believe that this conclusion will not be sustained, but that the adoption of a wider track for your road will not only allow an equal choice of markets, but lessen the cost of reaching these markets.

The distance from Montreal by your main line to Portland, thence to Boston by steamboats or rail-road, is but a trifle more than by your branch line, the Passumpsic, the Northern, the Concord, and other roads to the same point.

Between Portland and Boston there are steam vessels plying constantly, summer and winter. Passengers and all description of freight are carried on these steamboats at very low rates, in consequence of the competition with each other, and with the Rail-roads.

A competition must always exist on this route between rival lines of Boats and Rail-roads, which will continue to keep the rates low for all time to come. It is well known, that transportation can be done by Steamboats and Propellers at lower rates than by any other means of conveyance.

The facilities for the transhipment of freight at the Atlantic terminus, from your cars to vessels, will be of the cheapest and most superior character.

The location of the terminus is such as to afford more ample means and accommodations for an extended business, than perhaps any other Railway terminus on the continent.

A connection with the roads extending from Portland to Boston is contemplated, by which a choice of conveyance is at all times afforded to merchandize and passengers going in that direction, while another connection with the eastern part of Maine and the Lower Provinces is in progress, opening a communication for trade and travel going eastward.

If the object is to reach Boston with merchandize from the interior or to forward it from Boston to the interior, there can be no doubt but that it can be carried cheaper on this line than by any other route to the St. Lawrence.

Although the distance from Boston by this route may be somewhat greater than by others, yet one fourth of the whole distance between Montreal and Boston being by the cheapest mode of communication in existence, and the remaining portion of the route being a continuous line of Railway of great excellence and capacity, there is little reason to doubt the superior economy of this route.

If it is desirable to ship merchandize for Europe or any part of the United States, its delivery at Portland harbor gives in all respects equal or superior advantages.

With regard to importations made while the navigation of the St. Lawrence is closed, it may be observed that the more easterly position of Portland harbor and the greater safety and ease with which it is entered, will somewhat shorten the voyage, and the great saving in distance thence to Montreal will insure your main line the greater portion of this business, and affords additional reasons for a road of greater capabilities.

Your road is intended to form a large portion of the line to Quebec nearly equal to half the distance between the latter place and Montreal, and while it thus composes a part of the main line between the two most populous and important Cities of Canada, it furnishes to both a communication with the

sea board, and the means of winter importations. When your main line is extended to Quebec and to the Atlantic, the citizens of both places may make their winter importations with the same regularity and safety as though they were located on the sea-board.

Merchandize going in either direction between Quebec and England during the suspension of the navigation of the St. Lawrence, would probably take the shortest and cheapest route.

The people therefore of this part of the Province have a direct interest in whatever tends to lessen cost f transportation on your road.

From the general views I have thus taken of the probable course of the trade of your road both to and from the seaboard, I am led to believe that the great mass of merchandize will reach Portland Harbor and that with the exception of the Quebec trade it will pass over the whole length of your main line.

If this should prove to be the case, and there appears to be well founded reasons for looking forward to such a result, it is a subject of consideration in determining the Gauge of your road, what importance is to be attached to the freight business of the Passumpsic branch compared with the great mass which will go in another direction.

It remains to be considered how far you will be warranted in reference to your peculiar position and the efforts now making to turn the trade from the St. Lawrence above Montreal, and also in regard to the great interest of the public, which is deeply con-

cerned, in whatever lessens the cost of transportation, and retains the trade in its legitimate channels; I repeat, it is for you to consider how far it would be wise, under the circumstances, to lessen in any degree the capacity of your road.

In discussing the question of Gauge as connected with the business of the Passumpsic branch, I have thus far confined my observations to the subject of merchandize transportation.

It now remains to be considered whether the adoption of a different Gauge on your road from that of the Passumpsic branch will affect your passenger business unfavorably or afford less accommodation to the travelling public.

I beg leave again to refer to the system of railways in the United States, as perhaps affording the nearest approximation both in construction and management to what will be found from the similarity of the country and the nature of the business to be done, most suitable for Canada.

The line of railway between Boston and Buffalo is as before stated, 535 miles in length, and is operated by ten separate corporations.

As every line yet projected from Montreal to Boston nearly resemble this in the proportionate number of corporations, and other circumstances, there appears to be much propriety in referring to the management of passenger business on this line.

A number of these corporations own the passenger, baggage and mail cars jointly.

This arrangement extends from Rochester to

Schenectady, a distance of 236 miles. On the remaining distance it is believed that the passenger cars belong to separate Companies, each furnishing a proportionable number, if run over several roads.

The same cars run from Buffalo to Rochester, a distance of 73 miles, where a change takes place, the passengers are transferred to other cars; thence to Utica, a distance of 158 miles, the same cars are continued, where another change takes place.

At Schenectady, distant from Utica 78 miles east, there is another change where passengers are placed in the cars of the Schenectady and Troy road, thence to Troy the distance is 19 miles. It is contemplated to extend the cars from Utica to Troy which will avoid the change at Schenectady.

After arriving at Troy, passengers for Boston take the cars of the Troy and Greenbush Company, and again change at East Albany to the cars of the Western and Boston and Worcester roads which run to Boston, a distance of 200 miles.

Here, it will be observed, there are 535 miles of rail-road on the same Gauge forming one line and operating in connection, yet in this distance, there are five points at which passengers are changed to different cars.

It is as yet, I believed, only proposed to avoid one change. But so far as I have been able to learn there is little difficulty in effecting these changes, or objections raised to them by the travelling community.

On a long line with the proper arrangements for the transfer of baggage, there would be no objection

on the part of passengers to a change of cars, for it would be a great relief after a long ride to change from dusty cars to those well cleaned and ventilated.

This transfer would probably take place at points where passengers would be furnished with refreshments or their ordinary meals, and I doubt not the opportunity would be gladly embraced by all as affording relief from the tedious monotony of a long rail-road journey. The safety of passengers requires that cars should be run no greater distance than will permit frequent and careful inspection of all their parts, and this cannot well be done except at the end of the journey.

Between Boston and New York, there are changes from road to road, and from road to Steamboat, and between New York and Philadelphia, and Philadelphia and Washington, the same thing occurs.

These changes are generally looked forward to with pleasure, as it gives variety to the journey without adding to its inconveniences.

Changes are frequent and necessary for cross lines and branches. On the Western road, in Massachussetts, a transfer is made to several important branches, one of which forms a main line to New York.

At the commencement of the journey, the baggage is generally placed in enclosed crates, secure in every respect, each passenger receiving a check properly numbered, and a corresponding check is attached to each trunk or parcel, he is therefore under no apprehension about his baggage whatever the number of changes may be, and at the end of the journey he

has only to present his check and his baggage is delivered.

In England it is customary to carry the baggage on the top of the passenger cars, and as every change of car involves a change of baggage, each piece is to be removed separately from the top of one car to that of another.

Frequent changes of this character would I doubt not be highly objectionable, and this I believe constitutes the main argument against a change of passenger cars in England.

But when the baggage is transferred from one road to another without unpacking it or opening the crates, the objections to a change of cars cease.

As an evidence of some of the difficulties of an extended interchange of cars in England, I would refer to the testimony of Mr. Edward Bury, of the London and Birmingham road, before the Gauge Commissioners. He states that they are put to great inconvenience in consequence of the public not desiring to change, and that the trains are loaded with carriages far beyond what is necessary for the number of passengers. That the average number of passengers in the first class cars is not eight, whereas they will accommodate eighteen.

Mr. Bury, further states that in consequence of the great number of foreign carriages on their road, that they have one empty train each way daily, and that they have returned as many as 67 empty cars in one day. This is a very serious and unnecessary tax on the Corporation, which in this country should be avoided.

In Canada and the United States, the main lines of Rail-road, when a great system shall have been perfected, will be more extended, embracing a vast extent of country, and it would be preposterous to attempt an interchange of cars, throughout the two countries or any considerable portion of them, and transfer of both freight and passengers will at various points be unavoidable.

There are now probably over 5000 miles of railways in operation in the United States, and in the management of so extensive a system much valuable experience has been acquired, yet the transfer of passengers on these railways is of common occurrence, and little is ever said about it, simply because the arrangements are ordinarily such as to relieve passengers from any anxiety about their baggage and otherwise is to them a subject of indifference.

Judging therefore from the experience of these roads, it does not appear probable so far as the passenger business of the Passumpsic branch is concerned, that a difference of Gauge at the boundary line would have any effect on the revenue of your road.

With the *same* Gauge I do not think you would find it advisable to allow your passenger cars to go out of the Province in this direction.

The distance from Montreal to the boundary line by this branch is about 128 miles; and under the circumstances there appears much propriety in making this point the place of transfer, for it could not be expected, neither is it desirable, that your passenger cars should run over all these roads to Boston.

The statements given in another part of this report relative to the subject of merchandize transportation will I trust aid somewhat in coming to a conclusion as to the probable amount of freight which will pass over this branch for shipment or for the Boston market. And I will further observe that it is desirable on account of convenience, regularity and despatch of business on your road, that your Boston trade should continue over the whole length of your main line, which, I believe, will be found to be for the interest of the Public.

The merchandize passing over your road for the Boston market will bear a small proportion to the amount destined for England and other markets; and your main line furnishing a better means of conveyance than the branch for through freight whatever its destination, renders the question of break of Gauge on the Passumpsic branch of less importance.

I have already shown that a break of Gauge constitutes no objection as it regards passenger business. And in view of your peculiar position with reference to competing lines and the probable course of trade, I am decidedly of the opinion that a break of Gauge on the Passumpsic branch at the boundary line is preferable to an exchange of cars, and a sacrifice of the great advantages of a broad Gauge on your main line.

There is another and more extended view of the question of Gauge which is not only of great interest to your road, but of vital importance to the welfare and prosperity of all the Provinces.

Canada and the Lower Provinces embrace an extent of territory of over 414,000 square miles, with a soil of unsurpassed fertility, possessing great agricultural and mineral resources, and inhabited by a hardy and enterprising population, numbering nearly two million souls. It is watered by the great rivers and lakes of North America, and these waters are teeming with the trade of the surrounding territories.

It requires no prophetic skill to foretell the greatness of a country thus situated, and the vast increase of wealth and prosperity which will attend a full development of its great resources by a judicious system of internal improvement.

Government, with a full appreciation of the importance of this country, and the great natural advantages of the St. Lawrence for cheap transportation, has embarked in a great system of Canals, which are equal in importance and magnitude to any in the world.

It is not, however, a question whether the advantages of the St. Lawrence route are such as to retain the trade of the Canadas only, but it is rather whether these superior facilities shall not attract a large portion of the trade of the American States bordering on the great Lakes.

The rapidly increasing wealth and trade of the West are considerations of the greatest importance to both countries; and it is a question yet to be decided, which of the numerous rival routes to the Atlantic Seaboard, will be able to attract the largest share of that trade.

The Atlantic Cities, Boston, New York, Philadelphia, and Baltimore, with the aid and encouragement of their respective States, are all striving with commendable zeal to secure this great prize.

Baltimore is pressing forward with her great railway, which is destined to scale the Alleghany ridge, and reach the Ohio river at Wheeling.

Philadelphia with all the advantages secured to her by the long line of state canals which reach the Ohio River at Pittsburgh, has now embarked in the construction of the Central Rail-road, which is to perfect the great line of railway communication over the same mountain range to the Ohio River.

In like manner New York with all the incalculable benefits conferred upon her by her magnificent canals and her great central chain of railways, is pressing vigorously forward with her Erie road to reach Lake Erie at Dunkirk.

Boston not content with her Great Western Road, and the control of the roads composing the great thoroughfare westward in other States, is now extending her arms in other directions, with a view more effectually to secure the western trade. She is advancing with the construction of another road to Lake Champlain, thence to the St. Lawrence River at Ogdensburg.

She maintains that the opening of a channel of communication to the St. Lawrence at this point, will secure to her the balance of the trade of the Lakes which does not reach her through the Erie and Oswego Canals, and the Great Central Rail-road to Buffalo.

Another line from Cape Vincent opposite Kingston to Rome in the State of New York, is in contemplation, where it will unite with both the Erie Canal and the New York central line of roads, and thence the trade will reach Boston or New York at the option of the forwarders.

All these vast schemes of internal improvement have for their object the western trade.

Among the rival routes above referred to, there are several which have for their direct object the trade of the St. Lawrence, and will if not counteracted, divert a large portion of it from your canals, and Canada East.

In what light is the Ogdensburg road to be regarded, which is to form a direct railway communication from the St. Lawrence at that place to Boston? The great advantages of this line it is maintained by its friends, consists in its ability to divert the trade of the Upper Province from its legitimate channel, the St. Lawrence.

An able advocate of this road in a document published in Boston, after dwelling upon the difficulties of the navigation of the St. Lawrence below Ogdensburgh, the objections to the canals and the importance of the trade of the Upper Province, observes, " for these reasons the Ogdensburgh route to Boston " would have a decided preference over the Mont- " real route to Portland. But if the western trade can " go by Montreal at all, and is permitted to go there, " then there is no probability that Boston would take " any share of it. Preference of course would be

" given to the British carrying trade so far as legis-
" lation could do it, and if any portion of it must
" find an outlet at an American port, no doubt Port-
" land would be the place."

From this it appears that if the trade of the Upper Province is *permitted* to go down the St. Lawrence river, or through our Canals, it would, in that case, not be likely to reach that particular American Port, but would find its way to the Ocean in British Vessels.

It has been suggested that the Ogdensburgh road would not materially affect the business of the Canals; for the construction of a road from Montreal to the Boundary line, in the direction of Burlington, connecting with the Ogdensburgh road, would open a communication whereby the trade would come through the Canals to Montreal, and onward to Boston.

It is hardly reasonable to suppose that trade will pass the Ogdensburgh road, and take so circuitous a route, going an increased distance of 60 or 70 miles, passing Montreal, and thence in order to reach Boston, return to the same road at Lake Champlain.

This is manifestly well understood by the Capitalists who have embarked in the construction of the great line to Ogdensburgh, and they are fully aware that the trade must be taken by them from the St. Lawrence at Ogdensburgh, or the great mass will never reach Boston.

The distance from the St. Lawrence river at Ogdensburgh to Lake Champlain by the Ogdensburgh road, thence over the several lines of Railway to the

Seaboard at Boston, will not differ materially from the distance from the same point by the St. Lawrence river to Montreal, thence over your road to the Seaboard at Portland. The question, therefore, as to which channel of communication the western trade will take to the Seaboard seems nicely balanced, and it will preponderate to that route which will furnish the greatest facilities, and the cheapest mode of transportation.

All the rival lines of the States which approach the frontier between Buffalo and Ogsdenburgh will exert their influence in favor of a narrow Gauge in Canada, not because it is the best, but from the fear of the great superiority of a wider Gauge, and their inability, in case it is adopted, to compete so successfully in drawing off your trade. The countries are separated by natural boundaries, the great Lakes and the St. Lawrence river from Lake Superior to St. Regis, and at no point within these limits is it practicable, consistent with the navigation of the river, to connect the railways of the States with those of Canada, except at Niagara Falls.

Although it is proposed to erect a suspension bridge at this point, whereby a connection may be formed with these railways, yet I am fully convinced that no Railway Company in Upper Canada will ever find it for their interest to allow their Cars to cross Niagara river, for the purpose of running over the numerous roads of New York and Massachusetts, a distance of five hundred miles to the Seaboard. This, with reasonable economy and despatch, is im-

practicable. There must, unavoidably, be a change, and the probable point would, in this case, be at Niagara river. And I am informed by a person of high standing connected with the lines in Upper Canada, that it is not contemplated that their cars, except baggage cars, will run over the roads of New York. I have already shown that there would be no necessity even for this, were the same system of transferring baggage adopted here as on other main lines of the United States. The great business of the roads of Upper Canada will be in connection with your Lake, River, and Canal Navigation, and with the roads of the Lower Provinces.

In deciding on a system of Railways for the Provinces, which are to co-operate with the river and the canals, in contending against these powerful rivals for the Western trade, it becomes a question of vital importance to the people of Canada, that your Railways should have a greater capacity than those of your enterprising neighbours.

The St. Lawrence river and its auxiliaries—the stupendous canals of Canada—afford a line of navigation superior to any of your rivals, and should your various chartered rail-roads be constructed with the same liberal policy as regards capacity which characterize your canals, and the same regard to the great interests of the Provinces at large, there need be no apprehension as to your ability to retain your own trade or to compete successfully for that of the Lakes.

In this country there is about to be commenced a system of railways which will eventually extend

thousands of miles. Already have lines been projected which reach from Halifax to Lake Huron, passing the whole extent of the country, connecting your inland seas, rivers and canals, with your Atlantic coast, and joining all the Provinces together in one iron bond of union and commercial intercourse.

How important is it, therefore, in the commencement of this system, and before any of the links of this great chain are completed and fixed beyond remedy, that the subject of Gauge should be definitely determined for all the Provinces, and that it should be that which the experience of every country in which railways have yet been constructed, has been found to be desirable, and above all, that which the position and wants of this country demand?

The question of Gauge here is a different one from that in England, and many of the arguments which apply there with much force have no bearing on the subject here.

The agitation of the question there has been not as to the best Gauge for an entire new system of railways, but generally a contention between two parties actuated and guided by personal feelings, and strong pecuniary interest, in favor of two extremes, neither of which it is generally admitted is what is wanted.

In recommending a Gauge for your road, I have not been guided by a limited or sectional view of the Provinces, but in reference to the state of the whole country, its wants and capabilities, and the adoption of such a width of track as experience seems to point out as desirable for a perfect Railway.

The width (5½ feet) is not what is termed the narrow or broad Gauge, but is such a medium that while it avoids the objections to both extremes it combines all the requisites of a most superior road.

It is such that while it affords to the public the most ample means of communication, superior in all respects to the generality of roads, it does not by its greater capacity impose a burden or a tax on the smaller branches or unimportant lateral lines whose business may be less, and whose means of construction are limited.

Your road was regarded as one of great importance, forming part of the main trunk through the Provinces; it was the first road commenced (except one of 15 miles length) in the country, and therefore in determining the Gauge a great responsibility had to be assumed.

The arguments favoring an increased capacity for your road apply with corresponding force to all the Railways of the Provinces, and it is not now too late to bring about uniformity.

In this view of the case, I would earnestly appeal to the opinions of Engineers in England, and to the decision of the British Government as furnishing the most full and convincing proof of the position I have maintained.

The experience of English Engineers should and must have great weight with us in the discussion of this question, and we should turn our attention to their opinion, as no doubt forming the best grounds for a just estimate of the *value* of *Gauge*. The

question of the best Gauge for Ireland was finally settled in 1843 by Major General Paisley, Inspector General of Railways. He obtained the opinion of Engineers and Engine Builders of the greatest experience.

The opinions of the fourteen gentlemen to whom he addressed his inquiries, showed conclusively that a wider Gauge than 4 feet 8½ inches was the best. The average of their opinions was 5 feet 3 inches, and General Paisley decided upon this width, which has been adopted by Parliament for Ireland.

Since that date, the Report of the Gauge Commissioners has given us evidence that a still wider Gauge than 5 feet 3 inches has advantages over a less width in reference to power and economy.

It is well known that the Commissioners in the examination of the subject came to the conclusion, that, under the circumstances, there being 1901 miles of narrow, and only 274 miles of broad Gauge, Roads in Great Britain in operation, that in future all Roads to be constructed should conform to the narrow Gauge, and if a uniformity was required among those already constructed, the change should be from the broad to the narrow Gauge. This conclusion was arrived at, not from the alleged superiority of the 4 feet 8½ inch Gauge, over any intermediate one between it and seven feet, but as the best means in their opinion of obviating the difficulty of a break of Gauge in England.

But in connection with this part of the subject, the Commissioners observe, " We are desirous how-

" ever of guarding ourselves from being supposed to " express an opinion, that the dimensions of 4 feet " 8½ inches, is in all respects the most suited for the " general objects of the country."

The object of the inquiry was solely to devise means whereby under the particular circumstances in which the Rail-ways of England were placed, the real or supposed difficulty resulting from a break of Gauge, might be remedied, and therefore no opinion was expressed by the Commissioners as to the best Gauge for a new system of Railway in a country where few or none had yet been constructed.

The publication of the testimony taken before the Gauge Commissioners, brought the whole subject fully before Parliament.

This testimony with singular unanimity of opinion, established the desirableness of a wider Gauge than 4 feet 8½ inches.

No less than 19 out of 21 persons whose testimony was required on the *abstract question as to what gauge was in itself the best* gave opinions in favor of a greater width than 4 feet 8½ inches. Parliament referred the report of the Gauge Commissioners to the Lords of the Committee of Privy Council for Trade.

The Board of Trade instead of advising entire uniformity of Gauge as recommended by the Gauge Commissioners, say: " They are unable altogether " to concur with the Commissioners in the full ex- " tent of these recommendations," and further observe: " They would therefore recommend that the " lines for which Acts have been obtained, but

" which have not yet been completed, to the south " of the line from London to Bristol, should be per- " mitted to be constructed on the broad Gauge as " originally intended." And again add: " In suggest- " ing therefore (with some exceptions to be speci- " fied) the adoption of the recommendation made by " the Commissioners, that the '4 feet $8\frac{1}{2}$ inch Gauge " should be declared by the Legislature to be the " Gauge to be used in all Public Railways,' 'hereafter " to be constructed in Great Britain,' they do not con- " ceive that any declaration on this point should be " understood as positive and final. The working of " the wider Gauge established in Ireland, and the " future history of Railways in other Countries, may " possibly prove the superiority of some other and " intermediate Gauge, while the advance of science " and the course of experience may point out a prac- " tical method of altering an existing Gauge, and of " easily effecting a great operation which is now ge- " nerally conceived to be so costly and so difficult as " in truth to be impracticable."

The decision of Parliament was a full vindication of the opinion of the most skilful Engineers and Engine builders in the Kingdom. And Parliament established on their recommendation a Gauge of 5 feet 3 inches for Ireland where the question was open and unembarrassed.

The Statute of 9 & 10 Vic. Cap. 57, enacts, *that* 5 *feet* 3 *inches shall be the Gauge for Ireland*, and *that all Railways southward of the line of the Great Western Railway* (from London to Bristol) *shall be of the Gauge of* 7 *feet, and that those north of this line,*

excepting certain independent lines and roads connecting with the Great Western, shall be of the Gauge of 4 *feet* 8½ *inches.*

This decision was all that the friends of the broad Gauge could reasonably desire, and the deliberate judgment of the British Parliament may fairly be considered as adopting a Gauge of 5 feet 3 inches as abstractly the best.

Had Parliament been called upon at the same time to establish a Gauge for the Provinces, there is little doubt they would have decided upon a Gauge similar to that for Ireland

The Gauge for Canada should be wider than for Ireland. The same arguments which induced the adoption of 5 feet 3 inches there, would lead, at least, to 5 feet 6 inches here. The power should be in proportion to the magnitude of the business to be done, and it is evident that the long line of railways to be built in Canada will be required to transport a vastly larger tonnage than in a country of such limited extent as Ireland.

It should also be recollected that the nature of much of the freight in Canada which would pass overyour roads is bulky and heavy compared with its intrinsic value, unless therefore it can be carried in large quantities, and consequently at comparatively a cheap rate, it cannot be transported at all, for the expense will absorb too much of its value.

These considerations fairly carried out, with reference solely to the question of capacity as affected by the Gauge, would lead us to the adoption of a

Gauge wider perhaps than 5½ feet, but we have taken this limit in consideration of the question of expense, as applied to the branch lines, as well as the long main lines which are to be constructed, coupled with the opinions entertained by the respectable Engineers above quoted and my own, that 5½ feet will give every desirable advantage.

There appears to me no room to doubt this, and my sense of duty and regard to the interest of the Stockholders, constrains me to urge you to use all honorable means to secure to your road the advantages of the 5½ feet Gauge.

In recommending a wider Gauge than the prevailing one, I would not be understood as desiring to erect any barriers, or interpose any obstacles to the accomplishment of the objects sought by the promoters of rival lines. For they, in fact, open communications to good markets for the people of Canada, and they will of course be benefited not only by these avenues, but by the competition likely to arise as rival lines are increased.

But what I would recommend is simply that you give to your own lines all the superiority over your rivals which the experience of England and America has shown to exist in a broader Gauge, and leave to the enterprize of our neighbours to overcome these advantages as they best can.

I have the honour to be,
Sir,
Your Obedient Servant,
A. C. MORTON,
Chief Engineer.

CONVENTION

AND

FUNDAMENTAL ARTICLES OF AGREEMENT,

Between The St. Lawrence and Atlantic, and The Atlantic and St. Lawrence Rail-road Companies,

ENTERED INTO THE 17TH DAY OF APRIL, A. D. 1846.

THIS INDENTURE of two parts made and concluded this seventeenth day of April, in the year of our Lord one thousand eight hundred and forty-six, by and between the St. Lawrence and Atlantic Rail-road Company, acting by GEORGE MOFFATT, AUGUSTIN NORBERT MORIN and SAMUEL BROOKES, their Committee for this purpose, duly appointed on the one part; and the Atlantic and St. Lawrence Rail-road Company, acting by WILLIAM PITT PREBLE, JOHN MUSSEY and JOHN BUNDY BROWN, their Committee for the same purpose, duly appointed on the other part—*Witnesseth:* That, whereas the two Companies were incorporated for the express purpose, as appears by their respective Charters, of constructing a continuous Rail-road from the navigable waters of the River St. Lawrence, at Montreal, to the navigable waters of the Atlantic Ocean, at Portland, for the common convenience, use and benefit of the citizens, subjects and residents, as well as of Great Britain and its several Provinces and dependencies, as of the State of Maine and of the other States of the American

Union; and whereas, for the purpose of carrying into effect the intentions of the Provincial Parliament of Canada, and of the Legislature of Maine, in authorizing and empowering said Companies to construct said Rail-road, it has become necessary for the two parties to this indenture to agree upon some uniform plan and system of construction, and upon the point of connection and junction at the boundary between the territories of Great Britain and the United States, and upon some general principles, rules and regulations for the management and conducting of the operation and business of the road when constructed;—now, therefore, it is mutually covenanted and agreed by and between the parties of the first and second part, as follows, viz:

1st. The Atlantic terminus of the proposed Rail-road shall be on a wharf of suitable dimensions and construction for the purposes and business of the road, extending to the navigable waters of Portland harbour, to be built at such particular place at Portland as the Directors of the Atlantic and St. Lawrence Rail-road Company, in the exercise of their best judgment and discretion, shall determine to be most convenient and suitable for the purposes and business, and for the best interests of the road.

2nd. The St. Lawrence terminus of the proposed Rail-road, shall be on a wharf of suitable dimensions and construction for the purposes and business of the road, extending to the navigable waters of the River St. Lawrence, at such particular place opposite, or nearly opposite Montreal, as the Directors, or other proper Officers of the St. Lawrence and Atlantic

Rail-road Company, in the exercise of their best judgment and discretion, shall determine to be most convenient and suitable for the purposes and business, and for the best interests of the road.

3rd. The point of junction and connection between the St. Lawrence and Atlantic Rail-road and the Atlantic and St. Lawrence Rail-road, shall be at some place at the boundary between the United States and Canada, to be hereafter mutually agreed upon, after the various passes shall have been fully explored and examined by competent Engineers, and all material facts having a bearing on the question shall have been ascertained; it being distinctly understood and agreed that in no case shall the point of connection and junction be further west than the Coaticooke River: and further, that the point or place so to be mutually agreed upon, is to be that one only, which after such examination and exploration, a Commission, consisting of three members to be appointed under the authority of the parties of the first part, and three members to be appointed under the authority of the parties of the second part, shall, in the exercise of their best judgment and discretion, and after full consideration and discussion, recommend, and the Directors, or those exercising the authority of Directors of the respective Companies, shall afterward approve and determine to be most advantageous, and adopt.

4th. For the purpose of facilitating and expediting a decision in regard to the point of junction and connection between the two proposed

roads, the respective Committees, acting in behalf of the first and second parts, shall meet at Sherbrooke as soon as may be convenient, and there agree upon such general principles, and make such arrangements in regard to surveys and reconnoissances and points to be examined and routes to be explored, as in their judgment shall be best calculated to enable the two Companies to come to a speedy and satisfactory determination of the question. And it is mutually agreed by the respective parties of the first and second parts, that they will respectively, and as soon as circumstances will admit, take the necessary measures to have the point of junction fixed and finally settled and determined, as soon as it can be done consistently and understandingly, and with a full view and knowledge of all the facts and considerations, which ought to govern in their decision.

5th. The proposed road shall be constructed throughout its whole extent, on the same general plan and system. The bed of the road shall be laid sufficiently high to protect it from being clogged up and rendered impassable by ice or snow. The rails shall be of a uniform pattern, and of the same material and weight the yard. The Gauge shall be that of five feet six inches in the clear between the rails. The maximum gradient shall not, if possible, exceed sixty feet to the mile. The general direction of the road from the place of junction and connection to each terminus, shall be as straight as the nature of the country through which it passes, and the Charters and other circumstances, will admit. The road shall be laid out not less than six rods wide throughout its whole

extent. The bed of the road shall be made, and the rails laid in the first instance, with the ulterior view of a double track, when the business of the road shall require it.

6th. When the road shall have been so far completed as to be opened for business, each Company shall have furnished for the use of the road a sufficient number of Cars for passengers and freight, suitable for the business of the road. Rules and Regulations for conducting the business of the road shall be adopted, predicated upon the broadest and most enlarged principles of mutual convenience and accommodation, and with a view to advance the joint and reciprocal interests as well of the contracting parties as of the public. No distinction shall be made in the transportation of passengers on account of their citizenship or nationality; nor shall any difference or discrimination be made in the freight or other expenses of any article or merchandize on account of its foreign or domestic origin or ownership. The inhabitants of the British Provinces and the subjects of Great Britain on the one part, and the citizens of Maine and of the United States on the other, shall at all times be entitled to, and receive from the parties of the first and second parts respectively, the same accommodation and the same privileges at the same rates and charges, without any distinction or discrimination whatever.

7th. Eeach party reserves to itself the management, control and proceeds of its own way business. Passengers and freight transported over the whole length of both roads and also over the whole length of one

and a part of the other road, shall be considered, as between the parties to this indenture as through business. A tariff of rates of passage and freight through shall be agreed upon by the parties of the first and second parts, and the amount received in each case shall be apportioned and divided to each party, according to the number of miles of their respective roads over which the passenger or freight shall have been transported.

8th. After this agreement shall have been approved, confirmed and ratified by the respective Directors or other Officers duly authorized, performing the duties of Directors of the respective Companies, each party shall commence without any unreasonable delay the construction of their respective roads and prosecute the same with all reasonable diligence, so that each party shall have completed the same to the point of junction at the boundary, and the whole road be in successful operation within five years from the time the point of junction and connection of the two roads shall have been fixed and finally determined in the manner hereinbefore provided by Articles Three and Four of this Indenture.

9th. In case any difference of opinion should arise between the Boards of Directors of the respective Companies, which could not be amicably arranged between the two parties, touching the rates of freights or passages, or the management of the respective roads, or the furnishing of Cars or Engines, or the just proportion of charges and expenses which in any case ought in equity to be borne by both Companies

or either, or respecting the transportation of passengers and freight by either road, or any other subject of difference, all such differences between the respective Boards of Directors, shall be submitted to arbitration in the manner following, viz:—One disinterested Arbitrator shall be selected by each Board of Directors, to whom the matter in controversy shall be submitted, and in case the Arbitrators thus selected cannot agree, they shall select a third Arbitrator, and the decision in writing by majority of the Board of Arbitrators thus appointed and constituted, on the point or matter in controversy, shall be binding and conclusive upon the two Companies, in regard to the matter so submitted.

10th. And it is hereby further agreed by and between the said two contracting parties to these presents, that in the event of war occurring between Great Britain and the United States of America, then and in every such case during the interruption thereby caused, this agreement shall remain in abeyance.

11th. This agreement and the covenants therein contained, having been signed by the respective committees of the two Companies, and having been first submitted to the Directors of the Atlantic and St. Lawrence Rail-road Company on the one part, and to the Committee (or Directors) for managing the affairs of the St. Lawrence and Atlantic Rail-road Company on the other, and by them respectively approved and ratified, and the Seal of the Corporation hereunto affixed, shall thereafter be forever binding on the two Companies.

And to the full and faithful performance of the several agreements by each party to be done and performed, and to the keeping of all and singular, the covenants by them to be severally kept, the said Atlantic and St. Lawrence Rail-road Company on the one part, and the said St. Lawrence and Atlantic Rail-road Company on the other, bind themselves each to the other.

And further, in satisfaction of any injury and damage which may arise from the non-fulfilment of any or all of the within stipulations, by either of the two contracting parties, the St. Lawrence and Atlantic Rail-road Company on the one part, and the Atlantic and St. Lawrence Rail-road Company on the other part, do hereby pledge the entire Capital Stock of their respective Corporations each to the other.

In Witness Whereof, the said *William Pitt Preble*, *John Mussey* and *John Bundy Brown*, on the one part, in behalf of the said Atlantic and St. Lawrence Rail-road Company, and the said *George Moffatt*, *Augustin Norbert Morin*, and *Samuel Brookes*, on the other, in behalf of the St. Lawrence and Atlantic Rail-road Company, have hereunto interchangeably set their hands the day and year above written.

G. MOFFATT.
A. N. MORIN.
SAMUEL BROOKES.
WM. P. PREBLE.
JOHN MUSSEY.
J. B. BROWN.

At a Meeting of the Directors of the St. Lawrence and Atlantic Rail-road Company, held at Montreal this eighteenth day of April, in the year of our Lord, one thousand eight hundred and forty-six:

The Sub-committee of the Board of Management of this Company, appointed by resolution of the 25th of March last, and further authorized by the Resolve of this Board of the 17th instant, having submitted to this Board for their consideration, an Indenture of two parts, bearing date the seventeenth day of April instant, entered into by the Honorable George Moffatt, the Honorable Augustin Norbert Morin, and Samuel Brookes, Esquire, a Committee for that purpose, duly appointed by the Committee of Management of this Company, and further authorized by the resolution of this Board of the 17th of April instant, on the one part, in behalf of the St. Lawrence and Atlantic Rail-road Company, and the Honorable William Pitt Preble, John Mussey, aud John Bundy Brown, Esquires, a Committee for that purpose, duly appointed by the Board of Directors of the Atlantic and St. Lawrence Rail-road Company, appointed under their Resolve of the 29th of October, 1845, on the other part, on behalf of said Company:

1st. *Resolved*, That the Indenture and Agreement aforesaid be and the same hereby is approved, ratified, confirmed and adopted as the duly authorized Act of this Board.

2d. *Resolved*, That a duplicate of this Act of ratification and adoption, attested by the President, be

attached or subjoined to the original Indenture, and the Seal of this Corporation be thereunto affixed, as required by the terms of said Indenture.

3d. *Resolved*, That said Indenture be entered at large on the Records of this Board.

In obedience to the Second Resolution above recited, I have subjoined a duplicate of the Act of Ratification to this Original Indenture, and affixed thereto the Seal of the St. Lawrence and Atlantic Rail-road Company, this twenty-first day of April, A. D. one thousand eight hundred and forty-six.

{ L. S. }

G. MOFFATT, *President.*

THOMAS STEERS, *Secretary.*

AT a Meeting of the Directors of the Atlantic and St. Lawrence Rail-road Company, held at Portland, this twenty-eighth day of April, in the year of our Lord, one thousand eight hundred and forty-six:

THE Committee of this Board, appointed under the Resolve of October 29th, A. D. 1845, having submitted to this Board for their consideration, an Indenture of two parts, bearing date the seventeenth day of April instant, entered into by the Honorable William Pitt Preble, John Mussey, and John Bundy Brown, Esquires, on the one part, in behalf of the Atlantic and St. Lawrence Rail-road Company, and the Honorable George Moffatt, the Honorable Augustin

Norbert Morin, and Samuel Brookes, Esquire, a Committee for that purpose duly appointed by the Committee of Management of the St. Lawrence and Atlantic Rail-road Company, on the other part, in behalf of said Company:

1st. *Resolved*, That the Indenture and Agreement aforesaid be and the same hereby is approved, ratified, confirmed, and adopted as the duly authorized Act of this Board.

2d. *Resolved*, That a duplicate of this Act of Ratification and adoption, attested by the President, be attached or subjoined to the Original Indenture, and the Seal of this Corporation be thereunto affixed, as required by the terms of said Indenture.

3d. *Resolved*, That said Indenture be entered at large on the Records of this Board.

In obedience to the Second Resolution above recited, I have subjoined a duplicate of the Act of Ratification to this Original Indenture, and affixed thereto the Seal of the Atlantic and St. Lawrence Rail-road Company, this 29th day of April, A. D. one thousand eight hundred and forty-six.

{L. S.}

WM. P. PREBLE, *President.*

B. CUSHMAN, *Clerk and Secretary.*

MONTREAL:—PRINTED AT THE CANADA GAZETTE OFFICE.